CLAIMS

What is claimed is:

1. A universal transmitter, comprising:

an input circuit including an antenna, a central processing unit (CPU) coupled to the input circuit, and a radio frequency (RF) circuit coupled to the CPU;

said CPU to generate a plurality of discrete digital outputs;

said RF circuit, in response to the plurality of digital outputs, to generate and transmit a local RF signal at a corresponding plurality of discrete scanning frequencies;

said input circuit to receive the local RF signal and a template RF signal including a target frequency and a modulation pattern, and to mix the local RF signal and the template RF signal and provide a mixed signal; and

said CPU to sample the mixed signal at the plurality of scanning frequencies, and to determine the target frequency of the template RF signal in response to the plurality of samples.

2. The transmitter of claim 2 wherein the CPU to (i) incrementally increase the scanning frequency of the local RF signal by a first predetermined amount, starting from a lower scanning frequency, until a magnitude of the mixed signal, above a lower threshold value, is detected, (ii) incrementally increase the scanning frequency of the local RF signal by a second predetermined amount until the magnitude of the mixed signal falls to or below the lower threshold value, (iii) store the current scanning frequency as a first frequency; (iv) increase the scanning frequency by a third predetermined amount; (v) incrementally decrease the scanning frequency by a fourth predetermined increments until the magnitude of

the mixed signal falls to or below the lower threshold value; (vi) store the current scanning frequency as a second frequency, and (vii) determine the target frequency as being between the first and second frequencies.

3. The transmitter of claim 3 wherein the CPU to set the scanning frequency of the local RF signal to a frequency below the first frequency or above the second frequency, and to sample the mixed signal at the set scanning frequency to determine the modulation pattern of the template RF signal.

4. The transmitter of claim 1 wherein the first and second predetermined amounts are equal, and wherein the lower threshold value is substantially equal to zero.

5. The transmitter of claim 1 wherein the CPU to sample the mixed signal at a set scanning frequency where a magnitude of the mixed signal is above a threshold value to determine the modulation pattern of the template RF signal.

6. The transmitter of claim 1 wherein the CPU generates the plurality of discrete digital outputs to cause the RF circuit to generate and transmit the local RF signal over a frequency range.

7. The transmitter of claim 5 wherein the frequency range is between 100 MHz and 1 GHz.

8. The transmitter of claim 5 wherein the frequency range is between approximately 280 MHz and 450 MHz.

9. The transmitter of claim 1 further comprising an analog to digital converter coupled between the CPU and the RF circuit, said digital to analog converter to detect the digital outputs of the CPU and, in response thereto, to provide an analog voltage to the RF circuit to control the scanning frequency of the local RF signal.

10. The transmitter of claim 9 wherein the RF circuit includes a voltage controlled oscillator (VCO) coupled to the digital to analog converter, said VCO to control the scanning frequency in response to the analog voltage provided by the digital to analog converter.

11. The transmitter of claim 1 wherein the input circuit comprises an amplifier circuit for amplifying the mixed signal and a wave shaping circuit.

12. The transmitter of claim 3 further comprising a non-volatile memory to store values representative of the target frequency and modulation pattern.

13. The transmitter of claim 1 further comprising a plurality of switches, wherein when a switch is pressed and held for a first predetermined time period, the CPU learns the target frequency and modulation pattern of the template transmitter, and stores values representative of the target frequency and modulation pattern in the non-volatile memory.

14. The transmitter of claim 11 wherein when the switch is pressed and held for a second predetermined time period, the CPU retrieves the values representative of the target frequency and modulation pattern, associated with the switch, from the non-volatile memory and generates digital outputs to cause the RF circuit to transmit an RF signal having the target frequency and modulation pattern.

15. A method of learning a target frequency and modulation pattern of a template transmitter, comprising:

transmitting, by an radio frequency (RF) circuit, a local RF signal at a lower scanning frequency;

concurrently receiving and mixing, by an input circuit, the local RF signal and a template RF signal including a target frequency and a modulation pattern, to provide an output signal;

incrementally increasing the scanning frequency of the local RF signal, by a first predetermined amount, until a magnitude of the output signal that is above a first threshold value is detected;

incrementally increasing the scanning frequency of the local RF signal, by a second predetermined amount, until the magnitude of the output signal falls to or below a second threshold value;

storing the current scanning frequency as a first frequency;

increase the scanning frequency of the local RF signal by a third predetermined amount;

incrementally decreasing the scanning frequency of the local RF signal, by a fourth predetermined amount, until the magnitude of the output signal falls to or below a third threshold value;

storing the current scanning frequency as a second frequency;

determining the target frequency as a function of the first and second frequencies;

adjusting the scanning frequency of the local RF signal to below the first frequency or greater than the second frequency; and

sampling the output signal a plurality of times to determine the modulation pattern of the template RF signal.

16. The method of claim 15 wherein determining the target frequency comprises adding the first and second frequencies to provide a sum, and diving the sum by two.

17. The method of claim 15 further comprising storing values representative of the target frequency and modulation pattern in a non-volatile memory.

18. The method of claim 16 wherein prior to transmitting the method comprises pressing and holding a switch for a first predetermined time period.

19. The method of claim 17 further comprising:

pressing and holding the switch for a second predetermined time period;

retrieving the values from the non-volatile memory; and

generating digital outputs to cause the RF circuit to transmit an RF signal having the target frequency and modulation pattern.

20. The method of claim 15 wherein the first and second predetermined amounts are equal.

21. The method of claim 15 wherein the first, second, and third predetermined values are equal and approximately zero.

22. A computer program product, comprising:

a computer usable medium having computer readable program code embodied therein to learn the target frequency and modulation pattern of a template transmitter in a universal transmitter, the computer readable program code in said computer program product comprising:

first computer readable program code to generate a set of discrete digital outputs to cause a radio frequency (RF) circuit to generate and transmit a local RF signal at a corresponding set of discrete scanning frequencies;

second computer readable program code to sample an input signal at the set of scanning frequencies, said input signal being a function of the local RF signal and a template RF signal including a target frequency and modulation pattern; and

third computer readable program code to determine the target frequency of the template RF signal in response to the plurality of samples.

23. The computer program product of claim 21 further comprising:

computer readable program code to provide digital outputs to incrementally increase the scanning frequency of the local RF signal by a first predetermined amount, starting from a lower scanning frequency, until a magnitude of the mixed signal, above a lower threshold value, is detected;

computer readable program code to provide digital outputs to incrementally increase the scanning frequency of the local RF signal by a second predetermined amount until the magnitude of the mixed signal falls to or below the lower threshold value;

computer readable program code to store the current scanning frequency as a first frequency;

computer readable program code to provide digital outputs to increase the scanning frequency by a third predetermined amount;

computer readable program code to provide digital outputs to incrementally decrease the scanning frequency by a fourth predetermined increments until the magnitude of the mixed signal falls to or below the lower threshold value;

computer readable program code to store the current scanning frequency as a second frequency; and

computer readable program code to determine the target frequency as being between the first and second frequencies.